

Symons's Meteorological Magazine.

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Richard Henry Curtis.

1847—1919.

THE death of Mr. R. H. Curtis takes away one more of the rapidly diminishing band of veteran meteorologists whose professional careers date back to the earliest days of the Meteorological Office. In this magazine for April, 1912 (p. 53), we chronicled the retirement of Mr. Curtis from the Meteorological Office after a period of service extending to 51 years, and we refer our readers to that volume for the portrait which want of space prevents our reproducing. Mr. Curtis entered the Meteorological Department of the Board of Trade under Admiral Fitzroy in 1861. He was at first in the Telegraph Room, which afterwards became the Forecast Branch, and later in the Marine Department where he was a colleague of the late Mr. G. J. Symons until the latter left to take up his life-work at Camden Square. Mr. Curtis's great aptitude for devising and improving instruments led naturally to his appointment in 1907 as Superintendent of Instruments and Observatories, a position which he held until his retirement in 1912. During this period he made a special study of sunshine recording and introduced an improvement in the mounting of the Campbell-Stokes sunshine recorder which is now regarded as the standard form. He also carried out experiments on the distribution of wind-pressure on flat surfaces. The information thus gained was recently put to a severe practical test in the design of an automatic apparatus for warnings of dangerous wind velocities used on some Irish Light Railways. This apparatus was said to work better than any other designed for a similar purpose.

For the last 15 years or so of his life Mr. Curtis lived at Warlingham, where he carried on meteorological observations regularly until compelled to give them up a few weeks before his death.

He was for long a Fellow of the Royal Meteorological Society and was a valued member of the Council for many years.

THE ZODIACAL LIGHT.

By the late COMMANDER M. W. CAMPBELL HEPPORTH, R.N.R., C.B.

RECENT numbers of the Meteorological Office Circular include correspondence with reference to the Zodiacal Light. The present writer therein suggests that the cosmic matter from which the light is reflected may surround the earth, instead of being an appendage of the sun. The well known astronomer, the Rev. Marc Dechevrens, writes, expressing his opinion, in the Circular, that the Zodiacal Light pertains to the sun not to the earth.

Perhaps among the numerous readers of your Magazine, there may be some who, having been interested observers of the zodiacal light, would add their own opinions in this matter.

The principal reason for my belief that the cosmic matter from which the light is reflected pertains to the earth is that it is visible on every clear moonless night in the tropics, as a band of nebulous light stretching across the sky from the western to the eastern horizon, and *vice versa*, whereas Father Dechevrens bases his argument for the opposite view, mainly upon the supposition that the phenomenon can be seen only at certain periods during the year.

The accompanying notes relating to the Zodiacal Light are culled from three meteorological logs, which were contributed by myself to the Meteorological Office in the years 1898 and 1899, in which frequent entries are made of such occurrences.

The Rev. Marc Dechevrens is one of the leading astronomers of the day; his opinions, therefore, command every consideration. Displays of the Zodiacal Light, however, do not assume the same brilliancy in temperate latitudes as they do in tropical regions; I have the less hesitation, therefore, in differing from him in this connection.

Observations of the Zodiacal Light.

(Extracted from a Meteorological Log kept on board the R.M.S. *Aorangi*, by M. W. C. HEPPORTH, Lieut. R.N.R., Commander)

1899—August :—

8th	.....	Noon	..	..	2° 47' N.	168° 49' W.
9th	.....	Noon	..	..	2° 22' S.	171° 33' W.
10th	.....	Noon	..	..	7° 38' S.	174° 7' W.

For several nights Zodiacal Lights have been visible from sunset to sunrise, reaching entirely across the sky, with a breadth of from 18° to 23°, perfectly distinct and clearly outlined.

1898—November :—

30th	8—8.30 p.m.	2° 13' S.	171° 54' W.
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December :—

1st	8—9 p.m.	7° 23' S.	174° 28' W.
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Zodiacal Lights very distinct showing plainly from western horizon to a little beyond the zenith and faintly onwards to the eastern horizon, thus being visible from Sagittarius through the successive Zodiacal constellations to Gemini, Pisces being in the zenith.

2nd 8—9 p.m. .. $11^{\circ}42' S.$ $176^{\circ}27' W.$

Zodiacal Lights very distinct (as on the two previous nights) until moonrise at 10.15 p.m. extending from Scorpio to Gemini.

7th 8.15—10.15 p.m. $30^{\circ}1' S.$ $178^{\circ}53' E.$

Zodiacal Lights visible from Scorpio in Lr. S.W. to Taurus in N.E.

13th 8.30 p.m. to mdnt. $34^{\circ}30' S.$ $153^{\circ}30' E.$

Zodiacal Lights appear over and across western horizon, shining moderately brightly from Aquarius to Taurus and gradually setting.

Occasions on which the Zodiacal Light was visible but did not extend between E. and W. horizon across the celestial Concave.

1899—January :—

9th	.....	8—10 p.m.	..	$20^{\circ}33' S.$	$178^{\circ}3' E.$
10th	.....	8—9 p.m.	..	$17^{\circ}1' S.$	$178^{\circ}14' E.$
10th	.....	7—9.30 p.m.	..	$12^{\circ}43' S.$	$176^{\circ}59' W.$
11th	.....	8 p.m.	..	$8^{\circ}18' S.$	$174^{\circ}24' W.$
12th	.....	7.30—11 p.m.	..	$3^{\circ}0' S.$	$172^{\circ}4' W.$
13th	.....	7.30—10 p.m.	..	$1^{\circ}39' N.$	$169^{\circ}50' W.$
14th	.....	8.30—11 p.m.	..	$6^{\circ}6' N.$	$167^{\circ}13' W.$
15th	.....	10—11 p.m.	..	$11^{\circ}12' N.$	$163^{\circ}52' W.$
16th	.....	11—midnight..	..	$15^{\circ}14' N.$	$161^{\circ}9' W.$

1898—June :—

14th 6—8 p.m. .. $2^{\circ}7' N.$ $169^{\circ}41' W.$

Remarkably bright in south.

16th 7—8 p.m. .. $8^{\circ}23' S.$ $175^{\circ}7' W.$

1897—December :—

21st	.....	From
		$23^{\circ}49' N.$ $155^{\circ}34' W.$
22nd	.....	to
23rd	.....	$13^{\circ}31' N.$ $162^{\circ}52' W.$
24th	.....

During the evenings of the 21st, 22nd, 23rd and 24th, the Zodiacal Lights were most distinctly visible from the horizon, in Sagittarius, through Capricornus, Aquarius, Pisces, gradually growing fainter and more indistinct, but still to be traced into Aries and even Taurus on the opposite side of the Zenith. Again each of these mornings just before sunrise they were very distinct from Sagittarius, through Scorpio, Libra, Virgo, until lost in Leo, almost at the zenith. Thus in the course of 24 hours they could be seen through ten out of the twelve "Signs of the Zodiac."

On the 22nd, at 8 p.m., Zodiacal Lights were very clearly visible to an altitude of 80° .

May :—

19th 6—8.45 p.m. .. $5^{\circ}35' S.$ $173^{\circ}30' W.$

Zodiacal Lights faintly visible in east to an altitude of 60° .

20th 7.45—8.45 p.m. $2^{\circ}37' S.$ $171^{\circ}30' W.$

Zodiacal Lights faintly visible.

June :—

28th 7 p.m. .. $11^{\circ}42'$ $162^{\circ}26' W.$

Zodiacal Lights brilliant from W.S.W. to N. by W. at altitude 40° .

Correspondence.

To the Editor of Symons's Meteorological Magazine

THE SPRING EQUINOX.

IN the Weather Report in *The Times* of March 22nd is the following passage :—"The incursion of the present type of weather with north-east winds, dull weather, and occasional sleet or snow, about the vernal equinox, usually portends the persistence of similar conditions over several days."

I have so often noticed the occurrence of snow at the period of the vernal equinox that I once drew the attention of a more experienced meteorologist than myself to the matter, but he said it was a mere coincidence. I think it is more than a coincidence, and that there must be some cause connected with the equinox itself to bring it about or why should it be such a frequent happening? In some years, after winters which have been almost snowless, the inevitable fall has occurred about March 21st.

I have looked up old weather registers for the last 100 years, (Luke Howard, 1820-9, a well kept register in Suffolk, 1830 to 1882, and my own, from 1883 to 1919), and find that in the 100 years snow is reported as having fallen between March 18th and 25th in no less than 52 years. What is the explanation?

Christchurch Lodge, Eaton, Norwich. ARTHUR W. PRESTON.

DEW PONDS.

I WAS very glad to see the letter from Dr. J. R. Sutton in your last number because in the interest of scientific accuracy it is most desirable that the statements made by Mr. Hubbard in his communication to the Institute of British Architects regarding the maintenance of ponds by dew or mist should be corrected. It is strange how this belief persists and what evidence is considered good enough to bring forward in its support. Mr. Hubbard's paper is full of statements for which there is really no satisfactory evidence whatever. For example, he accepts without question the story of the shepherd who measured a rise of eight inches in five rainless nights on a "dew pond"! Few people, however, take the trouble to weigh evidence and the miraculous has great attractions for many of us. But there is really no mystery about the maintenance of the so-called dew ponds. They are merely rain water receptacles and they are maintained because the rainfall affecting them is greater than the evaporation. This would be so even if they had no area draining to them, but this is never the case. I will take as an

example, the well known pond on the Downs, near Patcham, in Sussex. This pond has a water surface of 6,861 square feet, and a margin draining to it 15 feet in width. The area upon which the amount of rainfall must be calculated is therefore 10,568 sq. feet. The evaporation, taken on the area of the water surface, is based upon the records of the late Mr. Baldwin Latham, at Croydon.

The following table gives the profit and loss account in an average year, taking the rainfall at 30 inches which is somewhat under the mark :—

Month.	Rainfall.	Evaporation from Water Surface. Inches.	Rainfall.	Evaporation from Water Surface. Gallons.	Difference.
Jan. ...	2·13	0·25	11,728	828	10,900
Feb. ...	2·13	0·34	11,728	1,126	10,602
Mar. ...	2·07	0·94	11,397	3,113	8,284
April...	2·01	1·80	11,067	5,962	5,105
May ...	2·07	2·70	11,397	8,942	2,455
June ...	2·64	3·12	14,536	10,333	4,203
July ...	2·73	3·30	15,031	10,930	4,101
Aug. ...	2·64	2·70	14,536	8,942	5,594
Sept...	2·34	1·50	12,884	4,968	7,916
Oct. ...	3·51	0·82	19,326	2,716	16,610
Nov. ...	3·09	0·43	17,014	1,424	15,590
Dec. ...	2·64	0·23	14,536	762	13,774
Totals	30·00	18·13	165,180	60,046	105,134

* These figures show a balance over the whole year of upwards of 105,000 gallons, or for the six months, April to September, of more than 28,000 gallons, equal to 150 gallons a day due to the increment alone. If to this be added the contents of the pond at an average depth of two feet, we have 108,000 gallons available during the six months for watering sheep or cattle, or nearly 600 gallons a day. In a year of average rainfall, therefore, it is not to be wondered at that the pond should easily last the summer through. It is well known, however, that these ponds fall very low in exceptionally dry years. Such a year was 1911. In that year the profit and loss account, worked out in the same way as for an average year, shows that so far from there being a balance of rainfall over evaporation on the Patcham Pond in the six months, April to September, there was a loss of nearly 8,000 gallons. Notwithstanding this, if the pond were perfectly watertight, and unless the draught upon it were very heavy, it would not fail. It follows that there is no reason to look for any cause other than rainfall for the replenishment of ponds of the character dealt with by Mr. Hubbard in his paper.

5, Queen Anne's Gate, May 30th, 1919.

W. VAUX GRAHAM.

SUMMER AND WINTER TEMPERATURE VARIATIONS.

ALMOST as important as the difference in the general level of temperature between the summer and winter solstitial periods is the different type of temperature variation at the two seasons. It is well known, of course, though hardly sufficiently realized as a climatic contrast, that the diurnal range of temperature is large in summer but small in winter, and this, I suppose, is a good natural illustration of the law of cooling. In summer while the variation of temperature between day and night is very marked, the day to day vicissitudes, except when a sudden change in the type of weather occurs are not prominent. In winter, on the other hand, while the diurnal range is small the irregular non-periodic fluctuations of temperature associated with cyclonic wind changes are very conspicuous, with the result that the highest temperature of the "day" not infrequently occurs during the night. The latter occurrence is often quoted as something paradoxical, whereas viewed in the proper climatic light it should be regarded as quite a characteristic seasonal contingency between November and February. I do not know how often the highest temperature for the twenty-four hours has occurred during the night between May and August, but the instances must be very few relatively, and limited presumably to the occasions of a sudden change to a colder type of weather taking place in the early morning hours.

L. C. W. BONACINA.

27, Tanza Road, Hampstead, N.W. 3, June 3rd, 1919.

THUNDERBOLT AT DETLING.

THE following account is from the *Kent Messenger* of April 12th, 1919.

What is generally termed a "thunderbolt" caused some alarm during the thunderstorm on Wednesday afternoon, when about three o'clock, it fell on Detling Hill. The occupants of a motor lorry belonging to Messrs. Style and Winch were coming down the hill, when, following an unusually vivid flash of lightning and a heavy crash of thunder, they saw what appeared to be a flaming hot cannon ball shoot across the road just in front of them, smash through some "spiles," or fencing, and cut a tree before taking to earth with a violent explosion. This must not be confused with the ordinary meteorite, but is regarded as an interesting instance of what is known scientifically as "ball-lightning," an as yet unexplained phenomenon.

Men are trying to dig it out for preservation in the Maidstone Museum. The hole in the ground is about 2 inches in diameter. This I had from the men who are digging.

RICHARD COOKE.

The Croft, Detling, Maidstone, April 14th 1919.

MAMMATO-CUMULUS CLOUD.

REFERRING to the letter on Mammato-Cumulus in your last number, I may say these clouds are not infrequent in southern France; but they are of little value for forecasting weather, because they appear in the rear of thunderstorms or local squalls. To my mind, the Mammato-Cumulus seen in southern France indicates a reversal of the normal air currents, going downwards, in fact, and the festooned appearance suggests the crest of a wave breaking towards the earth.

I never saw the *pocky* or *mackerel* sky described in English meteorologies.

M. MOYE.

12, rue du Faubourg-Boutonnet, Montpellier, France. May 21st, 1919.

ROYAL METEOROLOGICAL SOCIETY.

A MEETING of this Society was held on May 21st, at 70, Victoria Street, S.W., Sir Napier Shaw, F.R.S., President, in the Chair.

A paper by Capt. C. J. P. Cave, and Mr. J. S. Dines, entitled, "Further Measurements on the Rate of Ascent of Pilot Balloons," was read by Mr. Dines. The paper discussed experiments made in the Albert Hall, in which a clear height of 40 metres is available from floor level to the grid at the centre of the domed roof. The formula in general use for the rate of ascent is, Rising Velocity, $V = q \cdot \sqrt{L} \div \sqrt[3]{W + L}$, where L = the free lift and W the dead weight of the balloon and q is a constant the value of which has to be determined under different conditions. It had been suggested that the value of q varied with different degrees of loading of the balloon. Attention was directed to this question and quantitative results obtained. Measurements were also made with a candle lantern of the pattern used for night ascents hung below the balloon. It was found that this produced no effect upon q . In timing the rate of ascent in closed buildings a fine thread has generally been attached to the neck and has been drawn up from the floor as the ascent proceeded. In the present case experiments which were made with and without such a thread showed that some correction is necessary where a thread is used. The general results confirmed the value $q = 84$, which is used at the present time, for balloons of the size generally adopted for pilot balloon work. This value gives velocities in metres per minute when lift and deadweight are expressed in grammes.

In the discussion which followed Lieut.-Col. Gold said that a considerable difference might exist between the rates of ascent in the open air and in a closed room. It would be of advantage if experiments could be conducted alongside the Eiffel Tower (400 metres high) with Observers stationed on each platform. He carried out experiments with two theodolites in France, and the resulting rates of ascent varied from 100 to 300 metres per minute. Sir

Napier Shaw thought the fact that several ascents were considered necessary for any conclusive result was very disturbing. It was desirable to devise a means of insuring the balloon rising in a straight line. Messrs. Bryant, Hopkinson and Silvester also spoke.

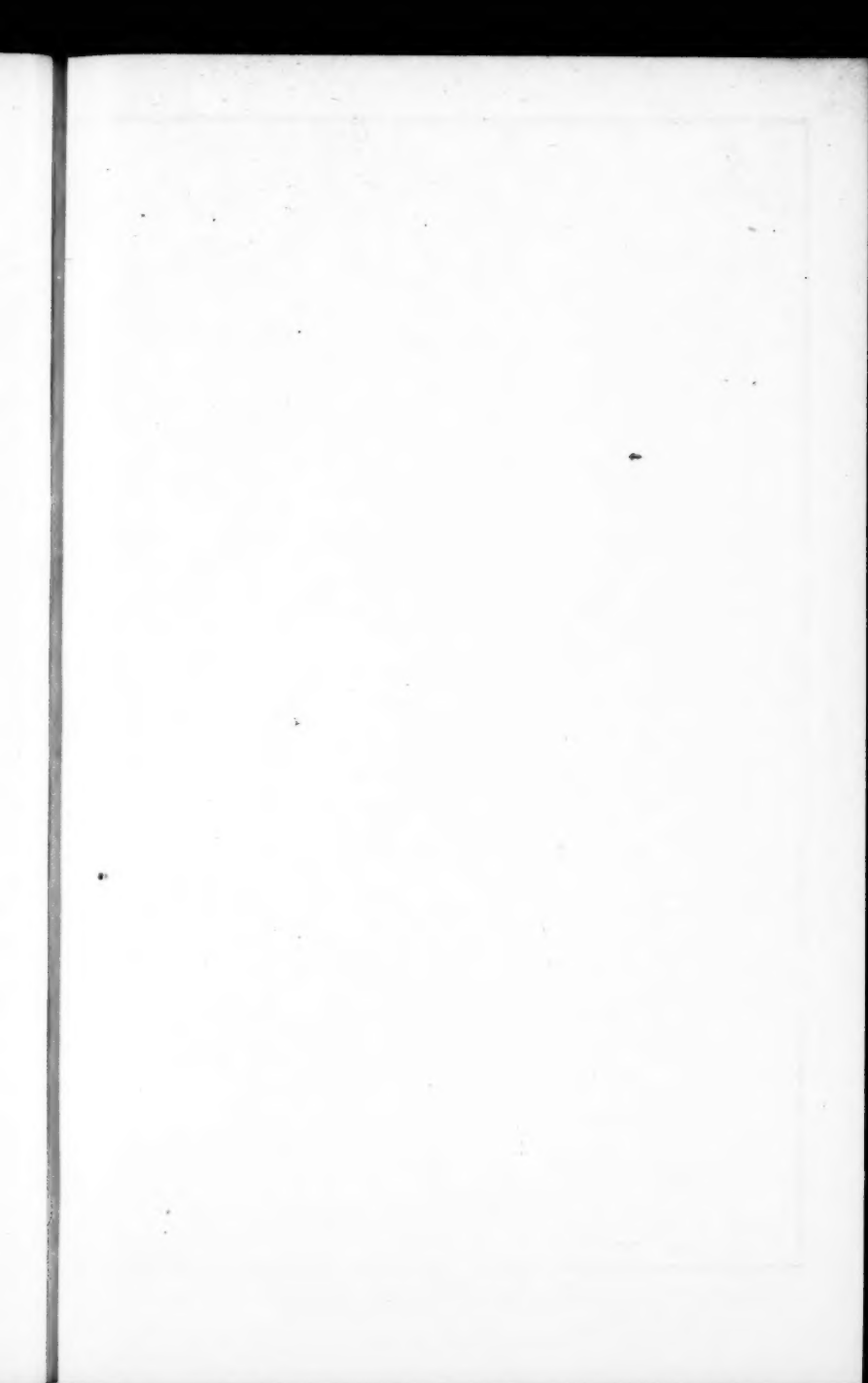
"The Report on the Observations for the Phenological Year, December, 1917, to November, 1918," by Mr. J. Edmund Clark and Mr. H. B. Adames was also presented. The excessive cold of December, 1917, was followed by three mild months. By April 1st blackthorn was in most parts blooming, and rarely had the farm and garden promise at this date been so satisfactory. The mid-April bitter weather was disastrous to the opening fruit tree buds, and a continuation of summer drought and coolness continued the prejudicial conditions. A genial August greatly favoured the earlier harvest districts, but the excessive wet in September caused damage and loss elsewhere. The whole autumn was cool, but comparative dryness in October and November helped finally in the harvesting of nearly average field crops. Potatoes gave a record for acreage and yield per acre. The migrant records supported the interesting weather relationships shown by the other tables. The isophenal lines on the map indicated the districts where plants blossomed simultaneously. Their course showed the marked influence of elevation. On the same map were also shown the isotherms for the first half of the year. The effect of the war was felt in the loss of many Observers who formerly contributed to this report and an increase in the present numbers is to be desired, particularly in the northern districts and in Ireland.

Lieut.-Col. Gold suggested that the results of the long series of observations should be summarised in the form of a general survey of the subject of phenology. The isotherms and the isophenes should be given on different charts with the addition of sunshine values.

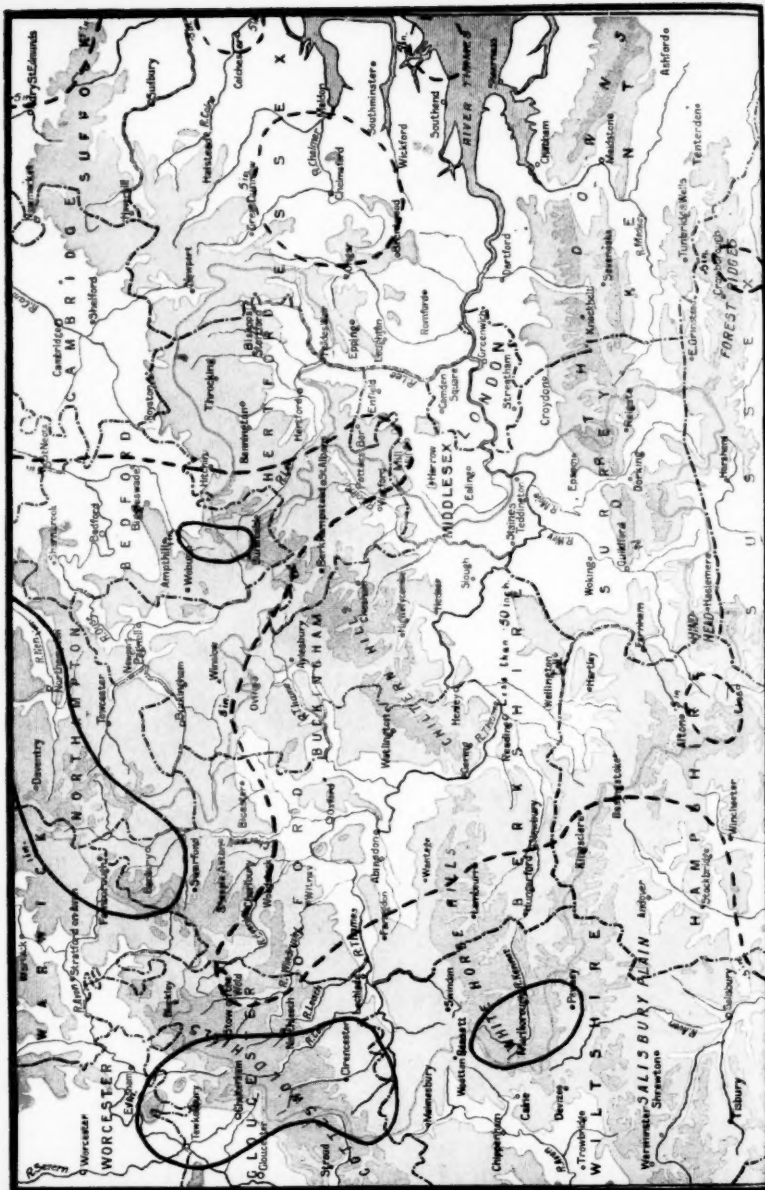
The following were elected Fellows of the Society :—Lieut. H. W. L. Absalom, R.E., E. V. Bacon, M.B.E., M.A., S. S. Burlingham, G. O. Capell, R.A.F., Admiral R. B. Farquhar, C.B., Miss E. H. Geake, M.Sc., A. J. Grant, G. B. Hamlin, Comm. G. Robinson Hudson, R.N.R., C. W. Lamb, Capt. P. A. Smee, R.A.F.

METEOROLOGICAL NEWS AND NOTES.

METEOROLOGICAL LIBRARIES.—The Council of the Royal Meteorological Society desire to call attention to the desirability of establishing meteorological libraries in important centres throughout the country. For this purpose they would suggest to those who possess series of meteorological publications, for which they have no permanent use, that they should offer them to form a nucleus for a library in some suitable place. The Society is prepared to supplement such libraries on the understanding that they will be ultimately available for public use.



THAMES VALLEY RAINFALL MAY, 1919.



ALTITUDE
SCALE

Below 250 feet 250 to 500 feet 500 to 1000 feet Above 1000 feet

SCALE OF MILES

0 1 2 3 4 5

THE WEATHER OF MAY.

OVER by far the greater part of Great Britain a marked predominance of anticyclonic weather resulted last month in one of the warmest and driest Mays on record. In Ireland, where the conditions were influenced very frequently by cyclonic systems moving over the Atlantic, the weather was of a more normal character.

During the opening week the effect of the oceanic disturbances was felt more or less over the United Kingdom generally, the winds being mainly from S. or S.W., and the weather changeable and rather cool. On the night of the 3rd a sharp ground frost occurred over North Britain, the exposed thermometer falling to a minimum of 19° at Balmoral and 21° at Crathes (Kincardineshire).

After the 6th barometric pressure became high in the north, and easterly winds therefore set in, slight ground frosts being experienced on the night either of the 7th or 8th in many localities, as far south as Greenwich. Between the 9th and 11th, when a shallow depression spread over the country from the south-westward, the conditions were again rather changeable. Thunderstorms occurred in the London district and some other portions of the south-eastern counties on the 9th, and at a number of western and northern stations on the 11th. After the latter date the type of weather in all but the western and south-western districts was almost continuously anticyclonic, the highest pressures being situated at first over northern Europe, afterwards over the North Sea, and finally over the United Kingdom. An extension of fine sunny weather proceeded in a similar fashion, and with winds blowing mainly from some easterly quarter the air became exceedingly dry. During the last fortnight there were many days upon which the relative humidity fell below 50 per cent.; at Kew and Leith there were five days on which it fell below 40 per cent., and at Eskdalemuir there were 6 days on which it fell below 30 per cent. In nearly all districts temperature rose to a very high level for the time of year. On the 23rd shade maxima of 80° or slightly more were recorded over eastern and central England, and towards the close of the month readings only a trifle below that level were observed in nearly all parts of the United Kingdom. At many English stations the mean of all the daily maxima for the month was more than 6° above the average, the value at Kew being the highest recorded in May, as far back at all events as 1871.

The effect of a warm air blowing over the cool sea surface was seen in a considerable prevalence of coastal fog, and at a few places in the west and south-west the total duration of bright sunshine was below the average. Over the country generally there was, however, a large excess.

The month was remarkably dry over the whole of Great Britain, the deficiency exceeding 75 per cent. of the average in the south and east of England, in Glasgow and the north of Scotland. The total fall was less than .50 inch over a great part of the Thames Valley and East Anglia, and exceeded 2 inches only in the mountain districts of Wales, Cumberland, and the Scottish Highlands. An absolute drought was experienced during the latter part of the month at many widely distributed stations. It was most marked in the Thames Valley where no rain fell after the 11th except at a few stations where the drought was broken by slight precipitation on the 25th. Ireland was generally rather wet and nearly twice the average fell at Glanmire (Co. Cork). The amounts varied from rather less than 2 inches in the north and east to more than 8 inches at exposed stations in Co. Mayo. The general rainfall expressed as a percentage of the average was:—England and Wales, 41; Scotland, 41; Ireland, 120; British Isles, 62.

In London (Camden Square) it was both the third driest and the third warmest May in 62 years' record. Mean temperature $58^{\circ}5$ or $4^{\circ}5$ above the average. Duration of sunshine 217.9 hours, and of rainfall 5.6 hours. Evaporation 2.94 inches.

RAINFALL TABLE FOR MAY, 1919.

STATION.	COUNTY.	RAINFALL.						
		Aver. 1875- 1909. in.	1919. in.	Diff. from Av. in.	Per cent. of Av.	Max. in 24 hours.		No. of Days
						in.	Date.	
Camden Square.....	London.....	1'75	'33	-1'42	19	'18	2	4
Tenterden.....	Kent.....	1'65	'46	-1'19	28	'22	25	6
Arundel (Patching).....	Sussex.....	1'80	'30	-1'50	17	'10	11	6
Fordingbridge (Oaklands).....	Hampshire.....	2'09	'68	-1'41	33	'27	6	9
Oxford (Magdalen College).....	Oxfordshire.....	1'81	'40	-1'41	22	'30	6	4
Wellington (Swanspool).....	Northampton.....	1'98	1'22	-76	62	'96	6	6
Bury St. Edmunds (Westley).....	Suffolk.....	1'93	'37	-1'56	19	'14	1	5
Geldeston [Beccles].....	Norfolk.....	1'78	'69	-1'09	39	'30	7	7
Polapit Tamar [Launceston].....	Devon.....	2'08	1'67	-41	80	'63	14	13
Rousdon [Lyme Regis].....	".....	2'02	'98	-1'04	49	'28	14	8
Ross (Birchlea).....	Herefordshir.....	2'10	'33	-1'77	16	'11	5	8
Church Stretton (Wolstaston).....	Shropshire.....	2'64	1'30	-1'34	49	'84	15	6
Boston.....	Lincoln.....	1'80	'67	-1'13	37	'22	24	6
Workshop (Hodsock Priory).....	Nottingham.....	2'08	1'07	-1'01	51	'45	6	8
Mickleover Manor.....	Derbyshire.....	2'10	1'21	-89	58	'31	6	8
Congleton (Buglawton Vic.).....	Cheshire.....	2'33	1'09	-1'24	47	'43	6	10
Southport (Hesketh Park).....	Lancashire.....	2'13	1'10	-1'03	52	'52	24	8
Wetherby (Ribston Hall).....	York, W. R.....	2'09	1'09	-1'00	52	'27	1	10
Hull (Pearson Park).....	" E. R.....	1'98	'84	-1'14	42	'30	1	7
Newcastle (Town Moor).....	North'land.....	2'04	'92	-1'12	45	'20	8	11
Borrowdale (Seathwaite).....	Cumberland.....	7'50	2'17	-5'33	29	...	...	...
Cardiff (Ely).....	Glamorgan.....	2'56	'89	-1'67	35	'19	3	11
Haverfordwest.....	Pembroke.....	2'62	1'47	-1'15	56	'45	11	13
Aberystwyth (Gogerddan).....	Cardigan.....	2'63	1'30	-1'33	49	'54	24	11
Llandudno.....	Carnarvon.....	1'86	1'09	-77	59	'38	15	9
Cargen [Dumfries].....	Kirkcudbrt.....	2'87	1'00	-1'87	35	'26	10	11
Marchmont House.....	Berwick.....	2'53	1'53	-1'00	60	'59	11	8
Girvan (Pinmore).....	Ayr.....	2'98	1'10	-1'88	37	'31	2	13
Glasgow (Queen's Park).....	Renfrew.....	2'40	'51	-1'89	21	'10	3, 4	7
Islay (Eallabus).....	Argyll.....	2'58	1'53	-1'05	59	'38	20	9
Mull (Quinish).....	".....	2'99	2'22	-77	74	'47	23	16
Loch Dhu.....	Perth.....	4'59	2'00	-2'59	44	'45	4	13
Dundee (Eastern Necropolis).....	Forfar.....	2'05	1'01	-1'04	49	'43	6	12
Braemar.....	Aberdeen.....	2'33	1'65	-68	71	'60	30	8
Aberdeen (Cranford).....	".....	2'40	'53	-1'87	22	'24	25	5
Gordon Castle.....	Moray.....	2'10	'28	-1'82	13	...	...	...
Drumnadrochit.....	Inverness.....	2'33	'54	-1'79	23	'16	11	7
Fort William.....	".....	3'93	1'39	-2'54	35	'36	11	13
Loch Torridon (Bendamph).....	Ross.....	4'54	1'52	-3'02	34	'35	2	10
Dunrobin Castle.....	Sutherland.....	2'19	'50	-1'69	23	'45	11	2
Glanmire (Lota Lodge).....	Cork.....	2'54	5'00	+2'46	197	2'02	13	9
Killarney (District Asylum).....	Kerry.....	3'05	3'54	+49	116	'70	14	20
Waterford (Brook Lodge).....	Waterford.....	2'33	3'82	+1'49	164	'18	14	14
Nenagh (Castle Lough).....	Tipperary.....	2'51	3'92	+1'41	156	'49	13	18
Ennistymon House.....	Clare.....	2'70	3'32	+62	123	'88	14	17
Gorey (Courtown House).....	Wexford.....	2'24	1'82	-42	81	'82	20	14
Abbey Leix (Blandsfort).....	Queen's Co.....	2'43	2'88	+45	118	'75	14	14
Dublin (Fitz William Square).....	Dublin.....	2'07	1'65	-42	80	'48	14	13
Mullingar (Belvedere).....	Westmeath.....	2'51	2'23	-28	89	'45	20	11
Crossmolina (Enniscoe).....	Mayo.....	3'17	3'50	+33	111	'55	1	22
Cong (The Glebe).....	".....	2'94	...	...	...	...	...	...
Collooney (Markree Obsy.).....	Sligo.....	2'80	4'01	+1'21	143	'83	14	18
Seaforde.....	Down.....	2'72	4'27	+1'55	157	'42	11	13
Ballymena (Harryville).....	Antrim.....	2'84	2'20	-64	77	'42	13	13
Omagh (Edenfel).....	Tyrone.....	2'66	1'84	-82	69	'29	1	18

SUPPLEMENTARY RAINFALL, MAY, 1919.

Div.	STATION.	Rain inches.	Div.	STATION.	Rain inches.
II.	Sevenoaks, Speldhurst Close.	·08	XI.	Lligwy	1·04
"	Ramsgate	·23	"	Douglas, Isle of Man	2·28
"	Hailsham	·22	XII.	Stoneykirk, Ardwell House...	1·46
"	Totland Bay, Aston House...	·46	"	Carsphairn, Shiel	1·44
"	Stockbridge, Ashley	·47	"	Langholm, Drove Road	1·65
"	Grayshott	·41	XIII.	Selkirk, The Hangingshaw..	1·59
"	Upton Nervet	·27	"	North Berwick Reservoir.....	·65
III.	Harrow Weald, Hill House...	·52	"	Edinburgh, Royal Observatory.	·66
"	Pitsford, Sedgebrook.....	·93	XIV.	Biggar	·79
"	Woburn, Milton Bryant.....	·70	"	Maybole, Knockdon Farm ...	·34
"	Chatteris, The Priory.....	·58	XV.	Shiskine	1·47
IV.	Elsenham, Gaunts End	·32	"	Ardgour House	2·02
"	Rayleigh	·36	"	Oban.....	1·39
"	Colchester, Hill Ho., Lexden	·65	"	Holy Loch, Ardnadam	1·86
"	Aylsham, Rippon Hall	·81	"	Loch Venachar	1·60
"	Swaffham	·44	XVI.	Glenquey	1·50
V.	Bishops Cannings	·82	"	Loch Rannoch, Dall	1·40
"	Weymouth.....	·81	"	Blair Atholl .....	...
"	Ashburton, Druid House.....	1·60	"	Coupar Angus	1·25
"	Cullompton	·81	"	Montrose, Sunnyside Asylum.	·70
"	Lynmouth, Rock House	·84	XVII.	Balmoral	1·34
"	Okehampton, Oaklands.....	...	"	Fyvie Castle	·47
"	Hartland Abbey.....	1·29	"	Keith Station	·39
"	St. Austell, Trevarna	2·05	XVIII.	Rothiemurchus .....	...
"	North Cadbury Rectory.....	·68	"	Loch Quoich, Loan	3·60
VI.	Clifton, Stoke Bishop	·34	"	Skye, Dunvegan	2·68
"	Ledbury, Underdown.....	·62	"	Fortrose	·35
"	Shifnal, Hatton Grange.....	·73	"	Glencarron Lodge	1·38
"	Droitwich.....	·67	XIX.	Tongue Manse	·87
"	Blockley, Upton Wold.....	·81	"	Melvich	·31
VII.	Grantham, Saltersford.....	1·99	"	Loch More, Achfary	1·37
"	Louth, Westgate	·57	XX.	Dunmanway, The Rectory ..	4·60
"	Bawtry, Hesley Hall	·82	"	Mitchelstown Castle.....	4·68
"	Derby, Midland Railway.....	1·36	"	Gearahameen	6·50
VIII.	Nantwich, Dorfold Hall	·69	"	Darrynane Abbey.....	3·64
"	Bolton, Queen's Park	1·83	"	Clonmel, Bruce Villa	4·06
"	Lancaster, Strathspey	1·63	"	Roscrea, Timoney Park ...	3·51
IX.	Langsett Moor, Up. Midhope	1·67	"	Broadford, Hurdlestown.....	3·12
"	West Witton	1·59	XXI.	Enniscorthy, Ballyhyland...	2·81
"	Scarborough, Scalby	1·33	"	Rathnew, Clonmannon	1·88
"	Ingleby Greenhow	·90	"	Hacketstown Rectory	2·54
"	Mickleton	·75	"	Ballycumber, Moorock Lodge	2·83
X.	Bellingham, High Green Manor	1·61	"	Balbriggan, Ardgillan	1·51
"	Illderton, Lilburn Cottage ...	·52	"	Castle Forbes Gardens.....	3·47
"	Keswick, The Bank.....	2·99	XXII.	Ballynahinch Castle.....	3·84
"	Orton	1·88	"	Woodlawn	3·54
XI.	Llanfrecfa Grange	·34	"	Westport House	3·29
"	Treherbert, Tyn-y-waun	2·34	"	Dugort, Slievemore Hotel ...	5·86
"	Carmarthen, The Friary	1·49	XXIII.	Enniskillen, Portora	3·26
"	Fishguard, Goodwick Station.	1·36	"	Dartrey [Cootehill]	3·16
"	Crickhowell, Tal-y-maes	1·10	"	Warrenpoint, Manor House ...	2·17
"	Birmingham WW., Tyrmynydd	·72	"	Belfast, Cave Hill Road	1·52
"	Lake Vyrnwy	1·38	"	Glenarm Castle .....	...
"	Llangynhafal, Plas Drâw.....	1·36	"	Londonderry, Creggan Res...	1·36
"	Rhiwbrydir	3·06	"	Milford Manse	1·67
"	Dolgelly, Bryntirion.....	1·56	"	Killybegs	3·34

Climatological Table for the British Empire, December, 1918.

STATIONS.	Absolute.				Average.				Absolute.		Total Rain		Aver.	
	Maximum.		Minimum.		Max.	Min.	Dew Point.	Humidity.	Max. in Sun.	Min. on Grass.	Depth.	Days.		Cloud.
	Temp.	Date.	Temp.	Date.										
(Those in italics are South of the Equator.)														
London, Camden Square	58·6	3	26·9	26	50·5	41·0	43·8	92	79·7	20·3	2·34	24	7·8	
Malta	66·6	10	48·0	2	61·1	53·1	...	85	117·0	43·0	3·69	14	2·3	
Lagos	90·3	9	70·0	21	88·0	74·3	21·1	71	154·3	60·3	·02	1	7·8	
Cape Town ...	89·7	31	53·7	27	76·8	59·1	54·7	64	...	...	·86	7	3·8
Johannesburg ...	85·2	16	47·1	1	75·6	55·5	53·8	74	...	48·8	7·58	13	6·5	
Mauritius	91·2	20	64·0	17	87·0	70·0	66·0	67	...	56·5	·82	8	4·4	
Bloemfontein ...	97·1	18	47·3	20	85·6	57·3	52·2	49	...	...	1·35	7	4·8
Calcutta	81·2	13	49·7	21*	77·0	55·2	52·2	64	...	39·9	·49	2	1·8	
Madras	86·0	16	67·2	30	83·1	72·0	69·5	80	156·7	62·5	6·67	8	5·3	
Colombo, Ceylon	89·1	20	68·2	29	86·1	72·6	71·2	80	160·8	63·6	4·45	17	7·0	
Hongkong	78·6	20	49·2	28	68·9	62·4	59·7	80	...	...	·14	4	8·2
Sydney	101·0	20	53·8	1	79·8	62·0	56·0	59	161·0	39·8	·89	7	4·0	
Melbourne ... ..	...	...	...	...	...	...	...	...	...	...	...	...	...
Adelaide	107·8	9	46·4	21	84·2	58·5	49·6	42	165·0	37·2	·62	5	3·2	
Perth	100·7	31	54·4	3	81·2	59·9	57·0	94	159·8	47·3	·24	5	2·5	
Coolgardie	107·2	5, 7	49·5	13	93·0	60·6	46·4	28	175·2	48·0	·11	2	1·6	
Brisbane	101·1	3	57·9	1	85·1	67·8	63·3	66	157·2	53·4	·88	7	4·7	
Hobart, Tasmania	91·3	23	43·0	21	69·1	51·7	44·8	53	157·0	37·2	1·81	14	6·9	
Wellington	74·6	17	42·9	14	63·9	51·4	48·2	72	149·0	30·0	2·73	11	5·3	
Jamaica, Kingston	91·4	10	66·6	27	87·5	70·3	68·0	79	...	...	·57	10	4·1
Grenade	86·0	31	71·9	Sev.	83·0	74·0	...	77	137·0	...	4·39	16	4·5	
Toronto	50·8	14	13·7	1	37·2	25·4	26·7	86	104·4	4·8	3·30	13	7·3	
Fredericton	49·0	23	- 5·5	8	28·0	12·9	15·2	83	...	...	2·26	12	6·0
St. John, N.B. ...	47·4	15	3·0	31	31·2	19·1	22·0	79	99·2	1·5	3·11	14	6·3	
Victoria, B.C. ...	51·2	14	30·2	31	44·6	37·1	38·0	88	98·0	23·5	7·15	17	7·0	

*and 26.

Johannesburg.—Bright sunshine 242·1 hours.

Bloemfontein.—Total R for the year 24·18 in., falling on 73 days.

COLOMBO, CEYLON.—Mean temp. 79°·4, or 0°·5 above, dew point 0°·2 above, and R 15 in. above, averages. Mean hourly velocity of wind 4·4 miles. TSS on 5 days. Prevailing direction of wind was north.

HONGKONG.—Mean temp. 65°·2. Bright sunshine 108·9 hours. Mean hourly velocity of wind 13·6 miles.

Adelaide.—Mean temp. 0°·2 above, and R 34 in. below, averages.

Perth.—R 34 in. below average.

Coolgardie.—Temp. 1°·0 above, and R about 50 in. below, averages.

Brisbane.—Temp. 0°·2 below, and R 4·07 in. below, averages.

Wellington.—Mean temp. 2°·7 below, and R 56 in. below, averages. Bright sunshine, 219·9 hours. Frost on 2 mornings. TS on night of 30th.

Cloud. Aver.

7.8
2.3
7.8
3.8
6.5
4.4
4.8
1.8
5.3
7.0
3.2
4.0
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3.2
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